

AMENDMENTS TO THE CLAIMS

Claim 1 (Currently amended): A machine for performing machining operations on a work-piece comprising:

a carriage;

~~a robotic arm mounted on said carriage, said arm having~~ a movable head containing a tool for performing the machining operations on the work-piece;

a laser position determination system ~~for determining~~ operable to determine the actual spatial relationship of ~~said the~~ carriage and ~~said the~~ work-piece and providing a first signal representative thereof and ~~to further determining~~ determine the spatial relationship of ~~said the~~ head to the work-piece during actual machining operations on the work-piece and ~~providing to provide~~ a second signal representative thereof;

a computer ~~having a computer program providing~~ processor operable to provide a third signal to the ~~robotic arm~~ movable head for machining the work-piece based on a predetermined spatial relationship between ~~said the~~ carriage and the work-piece and ~~for receiving to receive~~ the first and second signals and ~~adjusting to adjust~~ the third signal based on the actual spatial relationship between the carriage and the work-piece prior to machining operations ~~and said head and the work-piece during machining operations.~~

Claim 2 (Original): The machine as set forth in claim 1 wherein ~~said the~~ carriage is portable.

Claim 3 (Currently amended.): The machine as set forth in claim 2 wherein ~~said the~~ laser position determination system includes:

a laser transceiver system;

at least one first laser target mounted on ~~said the~~ carriage;

at least one second laser target mounted on the work-piece; and

at least ~~on one~~ third laser target mounted on ~~said the~~ head.

Claim 4 (Original): The machine as set forth in claim 3 wherein the carriage includes means to lock the machine in a position in proximity to the work-piece.

Claim 5 (Currently amended): The machine as set forth in claim 4 3 wherein ~~said~~ the laser position determination system includes a single laser transceiver assembly adapted to track ~~said~~ the at least one first, second and third laser target.

Claim 6 (Currently amended): The machine as set forth in claim 1, or 2, or 3, or 4, wherein ~~said the~~ laser position determination system for determining is operable to determine the ~~actual~~ spatial relationship of the work-piece during the machining operations.

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Claim 7 (Currently amended): The machine as set forth in claim 6 wherein ~~said the~~ laser transceiver position determination system comprises:

- a first laser transceiver assembly for tracking ~~said the~~ at least one target mounted on said the carriage;
- a second laser transceiver assembly for tracking ~~said the~~ at least one laser target mounted on the work-piece; and
- a third laser transceiver assembly for tracking ~~said the~~ at least one laser target mounted on said the head.

Claim 8 (Currently amended): The machine as set forth in claim 4-1 wherein ~~said the~~ laser transceiver position determination system comprises:

- a first laser transceiver assembly for tracking ~~said an~~ at least one target mounted on said the carriage ~~and said carriage; and~~
- a second laser transceiver assembly for tracking ~~said an~~ at least one laser target mounted on the work-piece.

Claim 9 (Currently amended): A computer controlled ~~machine for performing machining operations, on a work-piece, the machine having machining system comprising:~~

- a carriage with a movable head ~~containing a tool for performing the machining operations on the a work-piece, the computer having and~~
- a computer program for providing ~~first~~ signals to the head ~~for controlling the movement thereof to move the head to specific spatial relationships with the~~

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work-piece so that the tool can perform the machining operations, the machine comprising:

a laser position determination system operable to:

~~for determining the~~ determine a actual spatial relationship of between the carriage to and the work-piece, and provide a first signal representative thereof;

~~and to continuously determine the a spatial relationship of the head to the work-piece during the performance of actual machining operations and provide providing a second signal indicative of the actual position there of; and~~

~~the computer program adapted to compare said the second signal to the first signal and to adjust the first signal so that the head is positioned to the specific spatial relationships based on the actual spatial relationship between the carriage and the work-piece prior to machining operations and between the head and the work-piece during machining operations~~

Claim 10 (Original). The machine as set forth in claim 9 wherein the carriage is portable.

Claim 11 (Currently amended): The machine as set forth in claim 10 wherein ~~said the~~ laser position determination system includes:

- a laser transceiver system;
- at least one first laser target mounted on the machine;
- at least one laser target mounted on the work-piece; and
- at least one laser target is mounted on the head.

Claim 12 (Original): The machine as set forth in claim 11 wherein the carriage includes means to lock the machine in a position in proximity to the work-piece.

Claim 13 (Currently amended): The machine as set forth in claim 9, or 10, or 11, or 12, wherein:

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the laser position determination system also determines the spatial relationship of the work-piece during machining operations and provides a third signal representative thereof; and

the computer ~~program adapted to also~~ executable logic instructions are operable to compare ~~said~~ the third signal to the first signal and to adjust the first signal.

Claim 14 (Currently amended): A method of increasing the accuracy of a machine ~~for performing machining operations on a work-piece, the machine having that includes~~ a carriage with a robotic arm, the robotic arm having a head ~~containing a tool for performing~~ the including a tool that performs machining operations on ~~the a~~ work-piece, the head movable to a computed spatial relationships to the work-piece directed by a first signal from ~~the a~~ computer based on a predetermined spatial relationship between the carriage and work-piece, the method comprising ~~the steps of:~~

~~Determining~~ determining the actual spatial relationship between the carriage and the work-piece prior to machining operations and providing a second signal representative thereof;

continuously determining ~~the actual a~~ spatial relationship between the head and work-piece during the performance of machining operations and providing a third signal indicative of the actual spatial relationship ~~therebetween~~ there between;

and

adjusting the first signal based on the difference between the first ~~and~~ signal and the second and third signals such that the head remains in the computed spatial relationships to the work-piece.

Claim 15 (Currently amended): The method as set forth in claim 14, including ~~the step of~~ determining the ~~actual~~ spatial relationship between the carriage and ~~of~~ the work-piece during machining operations and providing a fourth signal representative thereof; and ~~during the step of additionally~~ adjusting the first signal based on the difference between the first and ~~forth~~ fourth signals such that the head remains in the computed spatial relationships to the work-piece with this adjustment continuously accomplished during ~~machining operations~~ machining operations.

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Claim 16 (Currently amended): The method as set forth in claim 15 wherein ~~said steps of~~ determining the ~~actual~~ spatial relationship between the carriage and the work-piece and providing a fourth signal representative thereof and continuously determining the ~~actual~~ spatial relationship between the head and the work-piece during the performance of machining operations and providing a third signal indicative of the ~~actual position~~ spatial relationship between the head and the work-piece, and ~~the step of~~ additionally adjusting the first signal based on the difference between the first and ~~forth~~ fourth signals such that the head remains in the computed spatial relationships to the work-piece with this adjustment continuously accomplished during machining operations ~~are is~~ accomplished by means of a laser position determination system.

Claim 17 (Currently amended): A machine for performing machining operations on a work-piece comprising:

- a portable carriage;
- a robotic arm mounted on ~~said the~~ carriage, ~~said the~~ robotic arm having a head ~~for mounting a tool~~ for machining the work-piece;
- a laser position determination system comprising:
 - at least one first laser target mounted on ~~said the~~ work-piece;
 - at least one second laser target mounted on ~~said the~~ carriage;
 - at least one third laser target mounted on ~~said the~~ head; and
 - a laser transceiver for determining the spatial relationship of ~~said the~~ carriage, work-piece, and ~~said the~~ head during machining operations, respectively, and to provide output signals representative thereof; and
- a computer having a first part of a computer program for machining the work-piece with ~~said a~~ tool based on a preset spatial relationship between ~~said the~~ carriage and the work-piece, ~~said computer having~~ a second part of ~~said the~~ computer program adapted to adjust ~~said the~~ first part of the ~~said~~ computer program in response to ~~said the~~ output signals such that ~~said the~~ head is properly positioned during the machining

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operations should ~~said~~ the work-piece or ~~said~~ the robotic arm introduce positional errors.

Claim 18 (Currently amended): A machine ~~for performing machining operations on a work-piece~~ comprising:

a portable carriage;

a robotic arm mounted on ~~said~~ the carriage, ~~said~~ the robotic arm having a head ~~for mounting a tool~~ for machining a work-piece;

a laser position determination system comprising:

at least one first laser target mounted on ~~said~~ the work-piece;

at least one second laser target mounted on ~~said~~ the carriage;

at least one third laser target mounted on ~~said~~ the head; and

first, second and third laser transceiver assemblies for directing laser beams at ~~said~~ the at least one first, second and third ~~at least one~~ targets respectively and to provide first, second and third signals representative of spatial relationships of ~~said~~ the carriage, work-piece, and ~~said~~ the head during machining operations, respectively; and

a computer having a first part of a computer program for machining the work-piece with ~~said~~ a tool based on a preset spatial relationship between the carriage and the work-piece, ~~said~~ computer having a second part of ~~said~~ the computer program adapted to adjust ~~said~~ the first part of ~~said~~ the computer program in response to ~~said~~ the first, second and third signals such that ~~said~~ the head is properly positioned during the machining operations should ~~said~~ the work-piece or ~~or~~ ~~said~~ the robotic arm introduce positional errors.

Claim 19 (New): The machine as set forth in claim 1, further comprising a robotic arm mounted on the carriage upon which the movable head is mounted.

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